IN THE DRAWINGS

Please replace Figure 2 with the new Figure 2 enclosed herewith.

REMARKS

I. Introduction

In response to the Office Action dated May 24, 2005, claims 3 and 8 have been cancelled, claims 1, 4, 9-17 and 19-23 have been amended. Claims 1, 2, 4-7 and 9-26 remain in the application. Re-examination and re-consideration of the application, as amended, is requested.

II. Information Disclosure Statement

Applicants' attorney notes that the form PTO-1449 dated March 15, 2002, has not been initialed by the Examiner on the second page. Applicants' attorney requests that the Examiner initial the form and send a copy of the initialed form to Applicants' attorney.

III. Objections to the Specification

In items (1)-(5) of the Office Action, the specification was objected to for various reasons.

The Applicants have made the following amendments to address the Examiner's concerns:

With regard to item 2, the wording "LO2" on line 30 of page 4 has been amended to read "LO", making it consistent with Figure 2.

In making this amendment, it was observed that the local oscillator LO2 in Figure 1 and the local oscillator LO of Figure 2, were both identified by reference character 32. However, these two local oscillators would generate different signals. To avoid any confusion that this might cause, the reference character for the LO of Figure 2 was changed from "32" to "33" to distinguish between the two. The same amendment was made on line 30 of page 4 of the specification.

With regard to item 3, the subscript "2" at line 24 of page 8, has been amended to a "1" as suggested by the Examiner.

With regard to item 4, the Applicants submit that the wording "...channel VLO signals..." is correct. The circuit in Figure 9 receives two regular, periodic LO signals at the input (I and Q), and generates an I/Q pair of "virtual LO" signals as its output. "Virtual LO" or "VLO" signals are described and defined in the specification, for example, at page 9 line 19, page 11 lines 28 and 31, and page 13 line 25.

Under items 5 and 7 the Examiner objected to the term "the control signal and oversampling rate of the delta-sigma block". The Applicants note that this term has been amended to read "*a* control signal and oversampling rate of the delta-sigma block". Thus, proper antecedent basis now exists.

The Applicants also note that this limitation is clearly supported by the description of the invention. Throughout the specification, the VLO mixing signals are described as having properties which "vary over time" in order to emulate the targeted LO signal. The specification generically describes these time-varying VLO mixing signals as being generated by a synthesizer, which could be a delta-sigma modulator, as described with respect to Figures 9 and 10. As explained in paragraphs [0127] through [0131], the output of the delta-sigma modulator is governed by its control signal and oversampling rate. Clearly, the time-varying VLO mixing signals can be generated by varying the control signal and oversampling rate of the delta-sigma modulator over time.

III. Non-Art Rejections

In items (6)-(7) of the Office Action, claim 10 was rejected under 35 U.S.C. §112, for antecedent problems, while in items (8)-(9) of the Office Action, claims 25-26 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement.

Item 7 was addressed above, with respect to item 5.

Item 9 asserts that claims 25 and 26 are not supported by the specification. The Applicants do not agree.

These two claims are directed to software code in a hardware development language or the like, which allow one to fabricate the device of the invention. Electronic components and systems are not exclusively transferred between manufacturers and designers in hardware form, but often in the form of software – for example, in the form of hardware development language code. The use of hardware development language (HDL) code to transport the invention is described on page 17 of the specification at lines 26 – 32.

The Applicants understand that the specification is directed to the person skilled in the art. The person skilled in the art would clearly be able to generate HDL code to effect the invention, given the entirety of the description and figures as filed. Given an electrical schematic, for example, it is a mundane and straightforward exercise to generate equivalent HDL

code - the fact that exemplary HDL code is not provided in the description, is immaterial. The person skilled in the art could use any integrate circuit fabrication process to implement the invention, as various processes are known and used in the art, and the nature of the process has nothing to do with the invention itself.

The Applicants are entitled under the law to claims which are required to effectively protect the invention. Claims 25 and 26 explicitly protect the hardware development code form of the invention and therefore should be allowable.

IV. Prior Art Rejections

In items (10)-(11) of the Office Action, claims 1, 6-7, 15-17, 19, and 21-23 were rejected under 35 U.S.C. §102(b) as being anticipated by Kolber, WO 96/01006 (Kolber). In items (12)-(13) of the Office Action, claims 2-5 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kolber in view of Marz, U.S. Patent No. 5,390,346 (Marz). In item (14) of the Office Action, claim 8 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kolber in view of Itoh et al., U.S. Patent No. 5,787,126 (Itoh). In item (15) of the Office Action, claims 9-14 and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kolber in view of Itoh in further view of the Applicant Admitted Prior Art (AAPA). In item (16) of the Office Action, claims 20 and 24 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kolber in view of Manku et al., U.S. Patent No. 6,148,184 (Manku).

Applicants respectfully traverse these rejections.

The Applicants submit that the amended claims distinguish over the cited references.

Amended claim 1 is based on an amended version of the original claim 1, in combination with the wording of the original claim 8. All of the claims depend from this amended claim 1, so it is only necessary to address obviousness with respect to Kolber in view of Itoh, and Kolber in view of Itoh and Applicant Admitted Prior Art.

Disregarding the added elements of claim 8 for a moment, the balance of the amendments made to claim 1 are along of the lines of those made to the broadest claims in the Applicant's three related co-pending U.S. patent applications no. 10/070,012; 10/070,013 and 10/070,280. Both of applications no. 10/070,012 and 10/070,013 have now been allowed in view of the Kolber reference and the Issue Fees paid.

As Kolber is the primary reference that the Examiner has relied upon, a brief review of Kolber is helpful.

Firstly, it is important to note that the purpose of the Kolber design is to reject "spurious" signals. The term "spurious" appears in the Abstract, each of the 21 claims, and repeatedly in the Kolber specification. "Spurious" signals are defined by Kolber on page 1 at lines 26 - 32, and again on page 6 at lines 17 - 26 with respect to a specific example: when a 90MHz LO signal is used to demodulate a desired 80MHz signal, and there is a 100MHz "spurious" signal in the signal path, then both the desired signal and the spurious signal will demodulate to 10MHz. They explain that it is generally impossible to separate these two signals as they will overlap one another at 10MHz. Note that this is a completely different focus than that of the invention, whose primary focus is to reduce local oscillator leakage.

Kolber proposes a two-stage mixing topology that demodulates the desired signal, but allegedly suppresses this spurious signal. They do this by using two local oscillators (LO) that one would see in a typical superheterodyne topology, except that the two LO signals are modulated with the same spread spectrum (SS) pattern before they mix with the input signal. This is in direct contrast to the preferred embodiment of the invention, in which there is no such common pattern to the two separate LO signals.

Kolber argues that the desired 80MHz signal will be encoded by the first SS LO, and then decoded by the second. They also argue that the 100MHz will not be properly decoded by the second SS LO, so this signal would simply remain as noise at the output (lines 20 - 21 of page 6 read: "In other words, the desired signal is correctly spread in the bandwidth but the undesired signal is not." At lines 25 - 26 of page 6, Honeywell then notes: "... the desired signal may be recovered since it is spread differently from the undesired signal.")

Kolber does not explain how or why this works, but they clearly argue that this topology will not modulate or demodulate all input signals - only the desired input signal. Note that the filter plays no part in this selection process, as in the example they present, the intermediate frequency (IF) of both the 80MHz and 100MHz inputs will be the same - 10MHz.

In short, the Kolber reference is quite different from that of the invention, and a person skilled in the art would not use it as a basis to arrive at the claimed invention. In particular:

1. Kolber is attempting to address a different problem than that of the invention, focusing on rejecting spurious input signals rather than LO leakage;

2. Kolber is not attempting to emulate direct conversion at all, but is using a modified superheterodyne topology. Clearly, Kolber has an IF frequency as shown in Figure 2 and referred to on page 4 at lines 24 and 29. In contrast, the signal generated by the first mixer of claim 1 is clearly not an IF signal. Thus, Kolber cannot be said to describe any of the limitations of claim 1 referring to a "local oscillator signal being emulated";
3. Kolber requires additional functionality. For example, the mixing signals generated by Kolber must be synchronized. If the SS components of the mixing signals get out of sequence, then demodulation/modulation will not be done correctly. This explains why the delay 28 is required in Figure 2. The claimed invention does not require synchronization at all; and
4. It appears that the Kolber design simply does not work. Thus, it would not be used as the basis for any further work or investigations which might result in one stumbling upon the claimed invention.

The Examiner has opined that the original claim 8 is obvious given Kolber in view of Itoh. The Applicants submit that the amended claim 1 is clearly not obvious in view of this combination.

To begin with, Itoh does not address any of the shortcomings of the Kolber reference as outlined above.

Itoh is completely different from the invention and uses a filter on the local oscillator signal for a different purpose and in a different way than the invention. Itoh appears to be using "double frequency" local oscillators exclusively. In contrast, the invention uses "wideband mixing signals" as per claim 1. Itoh is using his LPF in Figures 28 and 29 to remove the second LO signal, and to suppress other noise such as RF signals. The invention is doing something completely different to the mixing signals, tailoring the mixing signal that is actually being passed through, rather than rejecting bands from it. These are mutually exclusive concepts.

Thus, Itoh is using a different signal (double frequency LO rather than wideband), modifying it in a different way (suppressing noise rather than tailoring the actual mixing signal being passed through), and doing so for a different purpose (to reject noise, rather than to modify the mixing signal).

Thus, Itoh does not teach in the direction of the invention and does nothing to address the shortcomings of the Kolber reference. Furthermore, there is nothing in either reference that suggests there would be any benefit in combining the two. The Applicants submit therefore, that the person skilled in the art would not be led by Kolber and Itoh in combination, to arrive at the claimed invention.

Finally, the Examiner has alleged that claims 9-14 and 18 are obvious with regard to Kolber in view of Itoh and Applicant Admitted Prior Art. The Applicants do not agree.

The Applicants note again, that the parent claims clearly distinguish over the cited references, considered both individually and in combination. The addition of the delta-sigma block in claim 9 further distinguishes the invention from the art.

While the Applicants concede that delta-sigma blocks are known in the art, the Applicants are not aware of any application heretofore, in generating mixing signals. As the Applicants have explained on page 14 at lines 5 – 10, delta-sigma blocks are used in analogue to digital converters, but this is an entirely different application. The Examiner has not provided any evidence that a person skilled in the art would be inclined to use a delta-sigma block in such an application, and the Applicants submit that this would be completely contrary to the conventional wisdom in the art.

The Applicants therefore submit that claims 9-14 and 18 are not obvious with regard to Kolber in view of Itoh and Applicant Admitted Prior Art. The Applicants ask that the Examiner withdraw this objection.

The Applicants submit that the balance of the claims similarly distinguish over the cited art, and therefore asks that the Examiner withdrawn any objections to these claims.

V. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited.

Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

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GHG/mrj

Encls: Request for Extension of Time
Replacement Drawing (Fig.2)